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Scientists as Audience: Science Communicators as Mediators of Wicked Problems

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ABSTRACT: Important intersections of science and public policy are often wicked problems that require bringing together information from multiple stakeholders with different worldviews. Taming wicked problems is facilitated by fostering trust and collaboration. To better tame these problems, we suggest conceptualizing scientists as an underserved audience for public-originating information, and propose a role for science communicators to speak to scientists. We offer some potential considerations for understanding scientists as audience for science communicators in such a role.

KEYWORDS: audience, wicked problems

1. INTRODUCTION

Considering the shift away from Public Understanding of Science (PUS) and toward Public Engagement of Science (PES), editor of *Public of Understanding of Science,* Martin W. Bauer, wrote that PES must be understood not only as the public's engagement with science, but it also must "be read as the engagement of science with the public" (2014, p. 3). The first reading suggests a need to evaluate mechanisms for engagement with the public to assure that they align with PES goals. To this end, Rowe and Frewer have gone to great lengths to both catalogue mechanisms from the literature for engaging the public in alignment with a PES mentality (2005) as well as to propose a framework for evaluating public participation methods (2004).

Yet the second reading Bauer mentions suggests a rethinking of the ways in which scientists engage the public. However, the difference in worldviews and assumptions between scientists and various publics can interfere with this engagement. Such interference is particularly problematic in the context of policy matters and decision making surrounding health, the environment, and natural resource distribution. These are complex problems that are frequently high stakes, urgent, or both. Inspired by Wickman's (2014) use of wicked problems

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as a clarifying framework for understanding these problems, particularly in the context of professional communication, we turn to the literature to find useful approaches to dealing with these problems.

Science communicators currently play a role mediating engagement of the public with science by helping reframe information and accommodating worldviews and assumptions of the public. Here, we present early research suggesting that there may be a role for science communicators to play in the other direction: reframing information flowing from the public to accommodate the needs of *scientists* as an underserved audience. Successful strategies for taming wicked problems, as well as a rhetorical analysis of scientists as an audience, provide introductory ideas for the goals and practices of science communicators in such a role.

2. WICKED PROBLEMS

Many of the complex policy questions that involve scientists can be considered wicked problems. To better understand how science communicators can better facilitate their taming, we look to literature on these problems for effective strategies. Wicked problems, first defined in 1973 by Rittel and Webber, have 10 characteristics that make them unsolvable by empirical means.

(1) There is no definitive formulation; one can never obtain all relevant information about the problem
(2) There is no "stopping rule". The systems involved are not static.
(3) Solutions are not true or false, but are good or bad: an enacted 'solution' may result in even more problems in the system.
(4) There is no immediate or ultimate test of a solution.
(5) Every solution is a "one-shot operation." People or places will be changed by each enacted plan, and the effects can not be reversed.
(6) There is no limit to the number of potential solutions and no "well-described set of permissible operations that may be incorporated into the plan".
(7) Each wicked problem has some aspect[s] that are unique to it.
(8) Each problem "can be considered to be a symptom of another problem".
(9) The solution of a problem changes based on how the problem is described or understood.
(10) The individual or group that attempts to solve the problem is liable for the consequences their plan engenders, regardless of the original intent.

Because wicked problems are multi-dimensional, they can be approached from many perspectives and fields of expertise. Current literature provides examples of groups addressing and taming wicked problems. Across this literature, we see a pattern of trust among stakeholders and collaboration toward a shared goal as important characteristics for taming wicked problems.

Including publics in collaboration is an evolving process that has seen a great deal of growth and research over recent years (Rowe and Frewer, 2004). One focus of this evolving process is fostering trust among the parties. For example, Beierle and Konisky (2000) assert that the "push for more participation is being driven by considerable optimism about its ability to improve the substantive and procedural quality of decisions" (p. 587). To interrogate this optimistic perspective, they analyzed several environmental planning projects that incorporated public input and found that properly organized and executed participation and collaboration to be successful:

> Many of the cases examined measured quite favorable against the social goals, suggesting that public participation can, in fact, meet many of the expectations that have driven its recent growth. Participants often shaped final decisions with their future "vision" for the resource of interest, goals for restoration, and priorities for action. Even where preexisting relationships were poor; many processes were able to resolve conflict and even increase trust. (Beierle & Konisky, 2000, p. 598)

This analysis demonstrates that involvement in participatory decision making can increase trust and improve outcomes, evidence in line with the "optimism" behind the push for such activities. Additionally, Weber and Khademian (2008) emphasize the importance of trust-based collaboration in maintaining and growing networks. Khadmin (2002) and Weber (2003) state that a "public manager," someone not granted official, government power, can still arise as a figure of authority and influence; this power is "earned or awarded by other stakeholders to those with access to critical resources or the ability to catalyze and apply them successfully for problem-solving purposes" (as cited by Weber & Khademian, 2014, p. 342). Officials in power, "recognizing the value of such CCBs (Collaborative Capacity Builders)" (p. 334), award collaborative power to these capable individuals. The awarding stakeholders are making a declaration of trust in the CCBs and expanding their collaborative network.

Environmental resource management is an area that has attempted to tame wicked problems for decades by involving stakeholder groups in planning and decision making. One mechanism for this, adaptive management, was first presented by Holling in 1978 as "a way to apply continuous process improvement to natural resource management" (as cited by Susskind, Camacho, & Schenk, 2012, p. 47). Collaborative Adaptive Management (CAM) and Adaptive Management Projects (AMP) build on the basic principles of adaptive management and are designed to increase public engagement and input relative to the original implementations of adaptive management. CAM and AMP are designed in hopes of increasing trust among policy makers, public stakeholders, and scientists by "ensur[ing] mutual gains" and avoiding "key problems […] including overlapping authority, conflicting decision-making processes and tension between stakeholders with different interests" (Susskind, Camacho, & Schenk, 2012, p. 47) that had caused other adaptive management projects to fail. Through the evolution of environmental management projects since 1978, we have seen many attempts at increasing in meaningful public stakeholder involvement (p. 50).

Adaptive management strategies continue to evolve. Lei (2014) studied the Sierra Nevada Adaptive Management Project (SNAMP), a modern variation on adaptive management. SNAMP aims to facilitate stakeholder engagement in the management process by presenting information in "traditional face-to-face meetings (e.g. field trips, public meetings, facilitated integration meetings) but also [through] digital tools such as digital information products, webinars, and an interactive website" (Lei, 2014, p. 4). An important directive of SNAMP is to make information available starting in the earliest stages of project development and continuing through the project's duration (Lei, 2014).

To determine if the project was successful in engaging stakeholders, Lei (2014) used data from web-analytic tools, such as Google Analytics, to map the consumption and dissemination of project data. These data include "[who] visited the site, how long the visitors have stayed on the site or on certain pages, which pages are the most visited, and how visitors travel from one page to another" (p. 3), and the social networks created around the data (p. 3). Web analytic tools allow for usability testing, allowing information managers to ensure information reaches its intended audience. Lei uses these same tools to map flow and consumption patterns of project information.

Lei finds that information from all levels of the project was viewed and disseminated by both public and academic stakeholders:

> The increase of information flow was accomplished by delivering project information to specific audiences via different information channels including scientific knowledge networks (peer-reviewed journals and USDA Digital Collections), web services and applications (the SNAMP website, Flickr, YouTube and Facebook), and online media networks (blogs, newspapers, and SNAMP news). (Lei, 2014, p. 22)

Lei also found that making all, even preliminary or early-stage planning data, increased "public interest, engagement, and trust" (p. 23) and made members of the public more likely to continue to participate in the collaborative process. The success of SNAMP and its information distribution mechanisms supports the idea that increasing information availability also increases trust and collaboration in management projects.

3. SCIENTISTS AS AUDIENCE

To better foster trust and collaboration, it is important to understand scientists not just as stakeholders, but as underserved *rhetorical audiences* with needs as important as citizen audiences. Not all publics are well positioned to meet the needs of scientists, which can hinder their ability to successful exchange ideas. Therefore, just as science communication specialists can mediate citizen engagement by reframing information and arguments flowing from scientists, PES suggests there is a parallel space for science communicators to mediate scientist engagement. We address a non-exhaustive list of three areas of consideration that could help science communicators meet the needs of a science audience.

Arrangement: Scientific articles, a dominant genre of idea exchange in science, are famously highly organized (Gross, 1996, pp. 85-96). This organization, demarcated by headings and subheadings, enables scientists to read "opportunistically" (p. xxix): perhaps flipping straight to the results, then the methods, and back to the results (a pattern more common for experienced scientists reading in their subfield) or instead reading the introduction, skimming the results, and then reading the discussion (a pattern more common to students). This kind of reading helps scientists both understand how a particular set of results were generated and to situate data into theoretical frameworks. Gross argues that the arrangement of the scientific article embodies induction as a means of coming to understand the world (p.86). Particularly in text, headings can help scientists locate specific parts of the argument and return to them as desired.

Because scientists rely on arrangement as a key strategy for keeping track of complex arguments and to understand the relationships among the different pieces, science communicators can serve scientists by reorganizing or mapping public arguments in a way that connects specific details to worldviews or theories. Two potential tools for this are Toulmin's model of argumentation (1958) and a community psychology approach, Causal Layered Analysis (CLA). Toulmin's model provides a useful and familiar option to many rhetorical scholars that, like the scientific article, is concerned with the very specific (i.e., "data"), and the very general or theoretical (i.e., "backing), and creating logical connections along the way. Bishop and Dzidic (2014) propose using a defined CLA methodology as a means of encoding the public's concerns by using "layers of analysis [to] facilitate critical thought as to what the deeper, underlying causes of an issue are" (p. 16). Their goal in using CLA is to find the underlying root of social issues and to avoid the "inappropriate strategies or interventions" (p. 14) likely to come from inadequate deconstruction of a wicked problem. In either case, because scientific articles are well understood by scientists to be idealized re-presentations of laboratory events, scientists are unlikely to find a "remixed" account of a citizen's argument to be "false."

Managing Assumptions: Another important function science communicators can serve is helping scientists manage assumptions they may have about the public. Two such assumptions are a deficit model approach and curiosity as a universal or "natural" trait. Although the science communication literature has steadily moved away from deficit-model thinking, many scientists, even those invested in engaging in participatory activities, either explicitly assume a knowledge deficit on the part of the public or will fall back on deficit-inspired assumptions. Science communicators can help scientists by highlighting instances when their reactions to the public fall back to this mode of thinking. Another such assumption is that people are "naturally" or "inherently" curious. Scientific culture (and much of academic culture as a whole) values and encourages curiosity, and success in science is in part dependent on an inquisitive nature. Therefore, scientists typically find themselves surrounded exclusively by other curious individuals. However, for many publics, inquisitiveness is far less important. Science communicators can help scientists, who may be expecting the public to be curious about the way systems work, guard against these expectations and keep from offending the public they are trying to build trust with.

Technology: Scientists are online and engaging, both with themselves and the public. Not only are science journals focusing on online dissemination, but there are a multitude of scientists blogging (some in connection with journals, such as the blogs on the PLOS Blog Network, and others on independently hosted platforms), tweeting, editing Wikipedia pages, and maintaining online laboratory notebooks. However, not all publics are comfortable navigating this multitude of digital spaces. Science communicators can go to many of these spaces on behalf of the public to present their arguments or concerns about policy. Alternatively, they can engage with scientists over how their work fits into the larger picture of policy and public participation. In an interview, science librarian Gerry McKiernan suggests that these digital spaces are essentially the location for the Burkean parlor of science discussion, including discussions about policy; if science communicators are invested in the public being heard, they should "go to where the scientists are—and that's the internet" (personal communication, May 30, 2016). Engaging with scientists in these digital spaces has the added benefit that, similar to Lei's work on SNAMP, data about such interactions can be collected via web analytics and used for monitoring effectiveness.

4. CONCLUSION

Science-related policy matters tend to be wicked problems with both scientists and public as essential stakeholders. As we saw in the wicked problems literature, fostering trust and increasing collaboration between stakeholders were important aspects of coming to a more satisfactory conclusion that provides "mutual gains" for all stakeholders. When stakeholders have different worldviews and assumptions, a common situation for scientists and the public, creating the kind of engagement that promotes this trust and collaboration can be difficult. An established role of science communicators has been to mediate the public's engagement with science. The changing theoretical framework from PUS to PES involves a shifting dynamic between citizens and scientists. This newer dynamic highlights contributions from the public, making accommodating the needs of scientists engaging with that information particularly important.

REFERENCES

Beierle, T. C., & Konisky, D. M. (2000). Values, conflict, and trust in participatory environmental planning. *Journal of Policy Analysis and Management*, *19*(4), 587–602.

Bishop, B. J., & Dzidic, P. L. (2014). Dealing with Wicked Problems: Conducting a Causal Layered Analysis of Complex Social Psychological Issues. *American Journal of Community Psychology*, *53*(1-2), 13–24.

Holling, C. S. (1978) *Adaptive Environmental Assessment and Management*. Wiley, Chichester, UK.

Khademian, A. M., (2002) Working with culture; how the job gets done in public programs. *Reference and Research Book News, 17*(3). Congressional Quarterly.

Gross, A. G. (1996) *The Rhetoric of Science*. Cambridge, MA: Harvard University Press.

Lei, S. (2014). Mapping webs of information, conversation, and social connections: Evaluating the mechanics of collaborative adaptive management in the Sierra Nevada forests (Order No. 3686388). Available from Dissertations & Theses @ University of California. (1667037814).

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155–169.

Rowe, G., & Frewer, L. J. (2004). Evaluating Public-Participation Exercises: A Research Agenda. *Science, Technology & Human Values*, *29*(4), 512 –556.

Rowe, G., & Frewer, L. J. (2005). A Typology of Public Engagement Mechanisms. *Science, Technology & Human Values*, *30*(2), 251–290.

Susskind, L., Camacho, A. E., & Schenk, T. (2012). A critical assessment of collaborative adaptive management in practice. *Journal of Applied Ecology*, *49*(1), 47–51.

Toulmin, S. (1958). *The uses of argument*. Cambridge: Cambridge University Press.

Weber, E. P., & Khademian, A. M. (2008). Wicked problems, knowledge challenges, and collaborative capacity builders in network settings. *Public Administration Review, 68*(2), 334-349.

Weber, E. P., (2003). *Bringing society back in: Grassroots ecosystem management, accountability, and sustainable communities*. Cambridge, MA; MIT Press.

Wickman, C. (2014). Wicked problems in technical communication. *Journal of Technical Writing and Communication, 44*(1), 23.